MAR 11 1943

Gas Journal

LIGHT - HEAT - POWER - BY-PRODUCTS

Vol. 241. 95th Year. LONDON, FEBRUARY 17, 1943. No. 4161. Price 1/-

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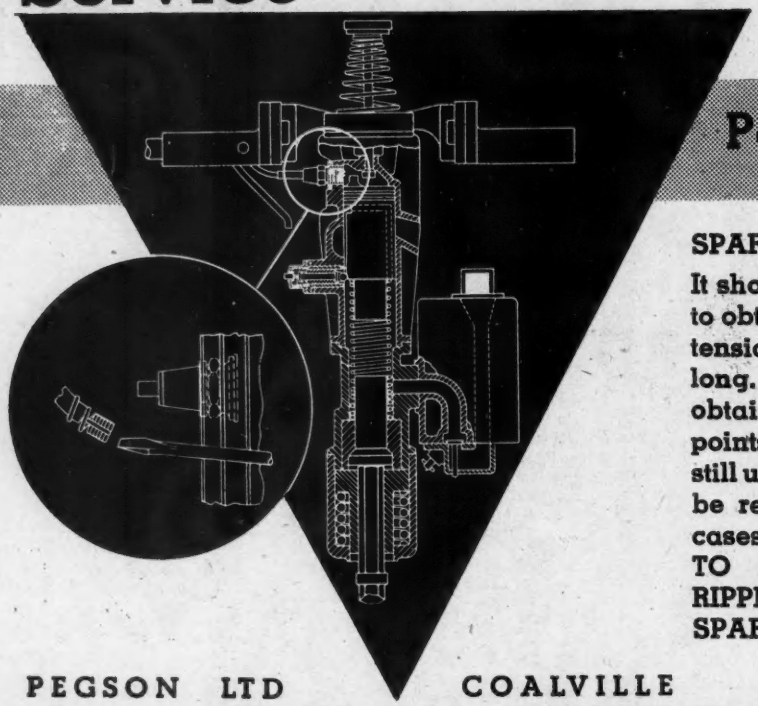

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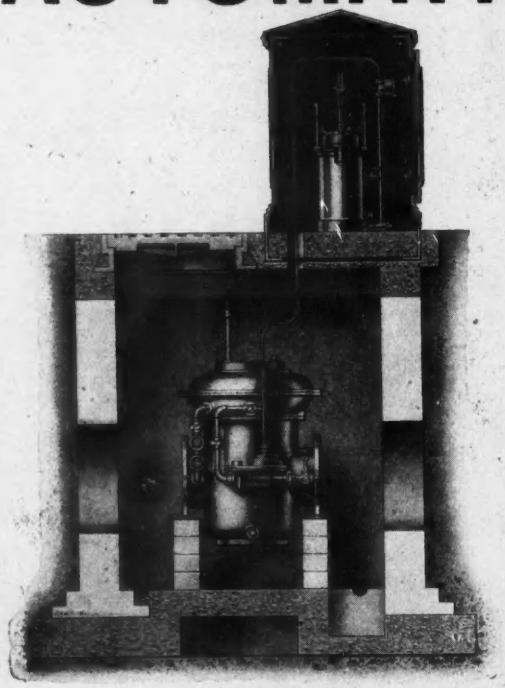

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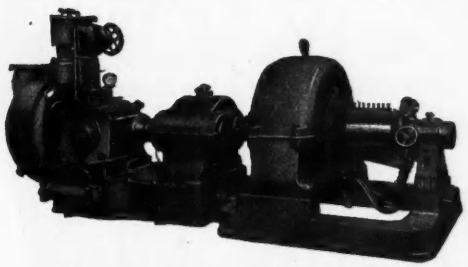

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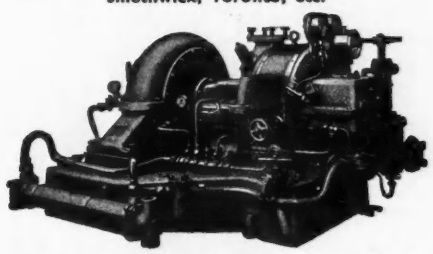

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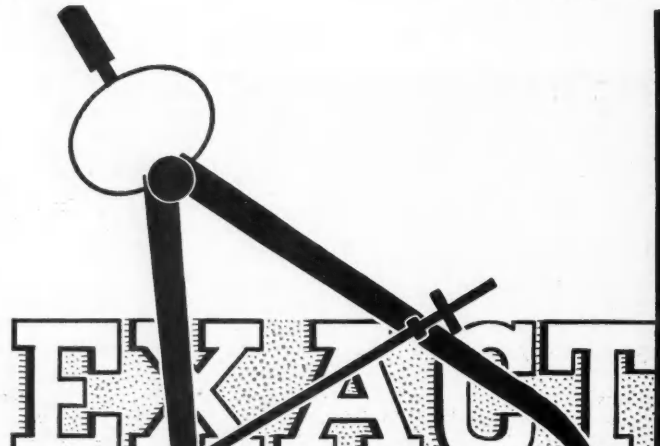

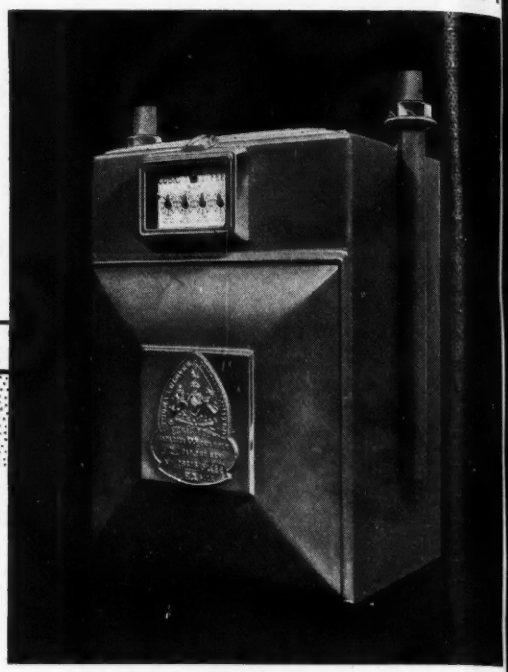

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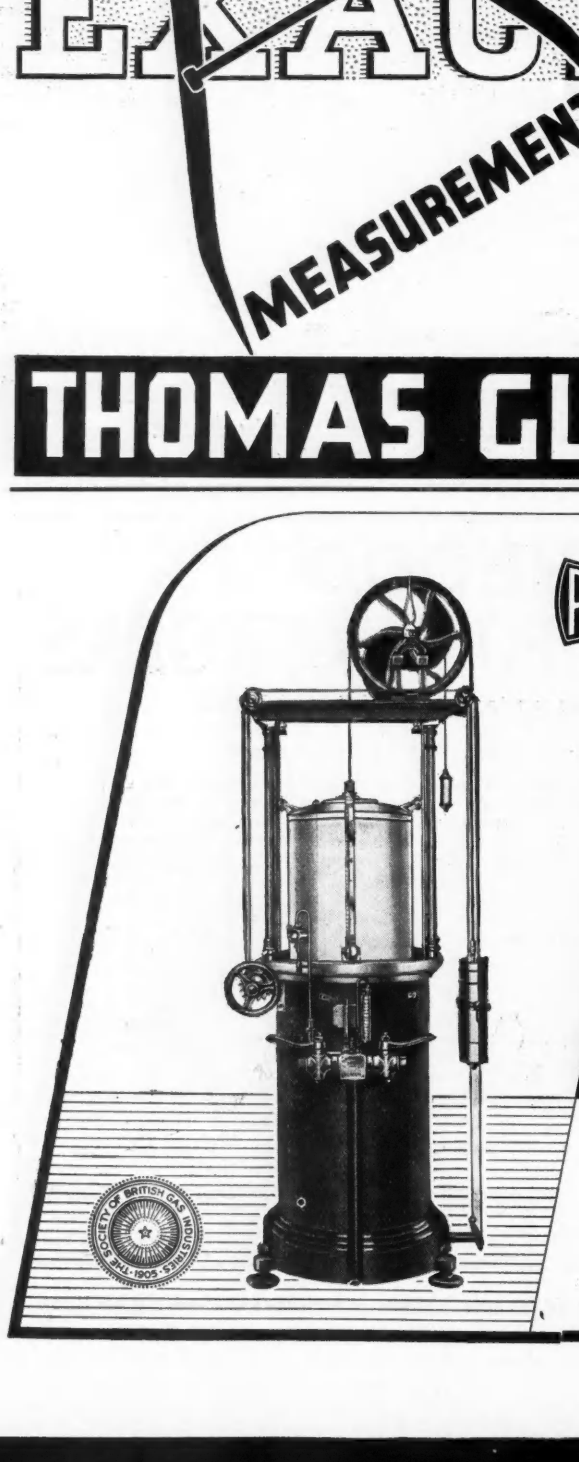

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P.2

GAS JOURNAL, FEB. 17, 1943

VOL. 241 95th YEAR No. 4161

EDITORIAL NOTES

LONDON GAS DIVIDENDS

GAS has been in the "financial" limelight with the resumption last week of dividends on all the stocks of the Gas Light and South Metropolitan Companies, including a small payment on the very widely held ordinaries of these two huge undertakings. These ordinary stocks had for so many years been regarded as a suitable holding for almost any class of investor that thousands of shareholders who could ill afford the loss must have suffered severely when conditions made it impossible, from the second half of 1940 onwards, for the Directors to recommend any payment at all. The present declaration of 1% is modest enough, but it will be welcomed as evidence of the wonderful efforts of all branches of the staffs to combat physical adversity, and of the increasing work of the Boards in obtaining a measure of remedy for injustices. As Sir David Milne-Watson pointed out a year or so ago, the prohibition against raising the price of gas amounted to London's cost of living being subsidized by gas company shareholders. There is still a long way to go before these ordinary stocks can be regarded as tempting to those in need of current income, but their market price clearly reflects the absence of any qualms, on the part of those who can afford to wait, as to prospects.

In the meantime the Industry itself will not have failed to note that both Companies have seen fit to declare the same ordinary dividend. Entirely without inside knowledge, we cannot help regarding this as possibly significant of, to say the least, an increasingly "brotherly" feeling between the two great undertakings which in close proximity and mutual aid, whenever circumstances demanded it, set such a magnificent example of standing up to the worst which the King's enemies were able to devise for their destruction.

GAS-WORKS SAFETY

THE Gas-Works Safety Rules Committee was formed in 1937 by the merging of the Purifiers Sub-Committee set up in 1928 and the Gasholders Sub-Committee, which came into being in 1929. The work of the Committee, which has been of the utmost use and which grows in scope—the Committee was appointed "to deal with all matters relating to rules for the safe operation of a gas-works"—was the subject of an interesting Paper by its Chairman, Mr. F. M. Birks, to the Southern Association last Friday. We publish the Paper and a report of the discussion on it in later pages of our issue to-day. As the Author pointed out, for many years the Board of Trade administered statutes relating to merchant shipping, the Mines Department the mining of minerals, and the Factory Department of the Ministry of Labour (formerly the Home Office) has watched over a hundred and one industries. It is therefore a tribute to the Gas Industry that it took 116 years before the incidence of the accident rate with regard to holders and purifiers was sufficiently high to attract attention from Government Departments which for years had been steadily increasing the standard of safety in other industrial undertakings. The work of the earlier Committees emphasized, however, the desirability of the Industry being at all times in a position to advise Government officials regarding regulations which are designed to provide adequate security for the individual with the minimum of inconvenience and expense to the Industry. The work of the Safety Rules Committee has shown that efficient rules can be formulated immediately they are required. The Committee has become a bureau of information on the technical aspects of safety—a source of knowledge which will, we think, stand the Gas Engineering Advisory Boards in good stead.

During the discussion emphasis was laid on the importance of providing adequate "safety staircases" for holders, particularly in view of the practice of oil filming, and stress was also placed on the desirability of making fully available information on mistakes made and accidents which occurred, so that benefit might be gained by free and frank disclosure and discussion of what actually was happening. The need for the young engineer to appreciate the nature of the precautions taken was also mentioned. On a specific precaution line, we were interested in the comments concerning the use of water gas plant as standby boiler plant. Gas-works cannot get very far without steam, and thought was directed to the use of water gas plant and the application of the producer gas made to the generation of steam in waste-heat boilers. A restricted supply of air could be admitted to the generator, saturated with steam at say 60°C., and the producer gas made could be burned with an excess of secondary air. With waste gases containing 6% of CO_2 and 14% of oxygen or thereabouts it is easy to ensure safe and uniform temperature conditions. A water gas unit of a capacity of 2 to 2½ million cu.ft. per day will in normal operation raise 7,000 to 8,000 lb. of steam an hour. But in normal water gas operation it is in fact steam raising for only 40% of the time. On producer gas working the hourly rate of steam raising could be considerably increased—up to 12,000 to 15,000 lb. an hour.

And we arrive at the more fundamental consideration that water gas plants are usually employed as peak load units; and it is not unknown that the meeting of peak loads may be delayed simply because the capacity of the works boiler plant for steam is saturated at the very time when the additional steam is needed to bring the water gas plant into operation to cope with the peak loads. The use of water gas plant as producer gas plant would, in fact, provide as it were a "self-starter" to peak load water gas production. Again, to start-up a water gas plant on air alone is to invite clinker troubles, which could be minimized by starting up the plant as a producer.

FUEL ECONOMY ON THE WORKS

IN recent Addresses in London and the Provinces Dr. E. W. Smith, Director-General of Gas Supply, has emphasized that one of the ways in which the Gas Industry could help itself under war conditions was in regard to the economies in fuel consumption which individual gas undertakings could make by attention to detail and by examining the obvious. He has no doubt that the internal working of individual undertakings could, by the exercise of common sense in this attention to detail, be tightened up. Obviously, to whatever extent gas undertakings can save coal, coke, and oil, they are making a real contribution to the present effort. They are also strengthening themselves and the Industry as a whole. In which direction Dr. Smith has emphasized the part which chemists could and should play, expressing his view that, generally speaking, chemists in the Industry have all too rarely been effectively used—adding that the laboratory staff should not be slot machines to carry out analyses without intelligence behind them.

Attention to detail is, we think, the keynote of the series of notes on fuel economy in gas-works which, through the courtesy of the Severn Valley Gas Corporation and Gas Consolidation, we are publishing in our pages. These essentially practical notes compiled by Mr. G. M. Gill should, if the hints contained in them are studied and are applied regularly in practice, prove

of very real value in supplementing in more detail the general advice being issued on the same subject by the Ministry of Fuel and Power. The suggestions made in the notes may appear simple, but we are certain that their application cannot be otherwise than beneficial. For example—and we have mentioned this before—it should not be possible in horizontal retorts with normal coal and under normal conditions to produce a straight coal gas of a calorific value lower than about 520 B.Th.U., and this with benzole extraction. Such a gas would have an inert content of about 10%. Yet there are many undertakings employing horizontal retorts and supplying gas of a calorific value below 420 B.Th.U.—a sign of inefficient working and fuel wastage. And regarding fuel wastage, there is the fuel used to provide producer gas, and ashes are taken out of producers in many cases with too high a content of coke. The chemist, as both Dr. Smith and Mr. Gill emphasize, should be allowed to offer his help in the proper running of gas-making and steam-raising plant. There seems to us no doubt that the employment of adequate technical staff to carry out the necessary tests and observations and then act on the information gained is one of the soundest investments that a gas undertaking can make. In which connexion we regard with much satisfaction the setting-up by the Gas Engineering Advisory Board in the Midlands of an organization in the form of a travelling laboratory. Equipment and staff will thereby be made available to gas undertakings which do not or cannot employ chemists.

Personal

As we briefly announced in our issue last week, Mr. C. A. MASTERMAN, M.A., F.I.C., M.I.Mech.E., has been appointed Convener of the Gas Industry's Post-War Planning Committee. Mr. Masterman was educated at Gresham's School and Balliol College, Oxford, and after serving in the Hampshire Regiment in the last War was seconded to a Sound Ranging Unit of the Royal Engineers. In 1920 he took an honours degree in Natural Science at Oxford. This he followed by a year's research before being appointed to the Chemical Defence Research Station. Six years later he joined the staff of the Gas Light and Coke Company, eventually becoming Chief Technical Officer at Watson House, working under the late Mr. Stephen Lacey. In 1940 the Director General, Chemical Defence Research Station, asked for his services as Assistant Director, and in the following year he became Acting Superintendent at the Experimental Station. During the past year he has been with the Ministry of Fuel in Dr. E. W. Smith's Gas Directorate.

Mr. Masterman is a member of the Gas Research Board Council, and is on various Committees of the Gas Industry and the Ministry of Fuel.

* * *

At the Annual General Meeting of the Wandsworth and District Gas Company held on Feb. 9, it was announced that Colonel C. M. CROFT, M.Inst.C.E., M.I.Mech.E., had been appointed a Director. His new duties as a Director will be additional to those of Chief Engineer and General Manager, which position Colonel Croft continues to hold.

* * *

Mr. ANDREW DRYBURGH, formerly Assistant to Mr. W. GILCHRIST at the West Wemyss Gas-Works of the Wemyss Coal Company, Ltd., has now been appointed Manager, Mr. Gilchrist having taken over the post of Manager at Inverurie.

* * *

Councillor CHARLES TURNBULL, Chairman of the Alnwick Gas Company, has reached his jubilee with the Company. He was previously Secretary and Commercial Manager and succeeded his late father, who also held those positions.

* * *

Flight-Sergt. J. A. LAWSON, only son of Mr. J. P. LAWSON, Manager of the Whitchurch (Salop) Gas Company, has been reported missing after operations on the night of Feb. 3–4.

Obituary

Mr. WILLIAM BALFOUR, Engineer and Manager of the Kirkcudbright Gas-Works, has died. Born in Dundee, deceased began his career at Carnoustie Gas-Works, and before going to Kirkcudbright was Engineer and Manager of the Gas-Works at Bridge of Allan.

Letter to the Editor

"Fuel Usage Index"

DEAR SIR,—While no one would deny the importance of the therms lost in the process of carbonization, it is to be hoped that it will not lightly be assumed that the "Fuel Usage Index" is also a complete index of efficiency.

Despite your belittling reference to minor products from coal tar, you do not, presumably, mean to suggest that the value of tar can be fairly assessed according to the therms contained in it, or that the value of therms in gas and coke are identical. Yet this is how they are treated in the "Fuel Index."

After all, if nothing matters but the number of therms available for sale there would be no justification whatever for subjecting coal to carbonization, since no matter how efficiently this process may be conducted, there must always be more therms available for sale in the coal than in the products derived from it.

14, Molyneux Park, Yours faithfully,
Tunbridge Wells. ARTHUR VALON.
Feb. 12, 1943.

Midland Association

The Annual General Meeting of the Midland Association of Gas Engineers and Managers was held on Feb. 11 in Birmingham, Mr. A. H. Cranmer presiding. After the confirmation of the minutes of the last meeting, the President heartily welcomed Dr. E. W. Smith, Director-General of Gas Supply.

The Annual Report and Statement of Accounts were received and adopted, and a report on the work of the Midland Commercial Gas Association was submitted by Mr. C. M. D. Belton. Following this a letter was read from Mr. F. C. Briggs on the work of the Midland District Education Committee and supplemented by remarks from Mr. C. F. W. Rendle.

Mr. C. C. Wood, of Wellingborough, Mr. S. K. Hawthorn, of Birmingham, and Mr. James Mitchell, of Leicester, were elected to serve on the Committee. Mr. W. McNaughton, of Wolverhampton, and Mr. W. Williams, of Tipton, were elected as Auditors.

Three new members were elected by ballot as follows: Mr. A. W. Elliott, Derby; Mr. H. R. Hems, Birmingham; and Mr. F. L. Wimhurst, Newcastle-under-Lyme. The recommendations of the Committee were approved that Mr. Rendle be the Association's representative on the Council of The Institution of Gas Engineers, and that the following be appointed to represent the Association on the Midland District Education Committee: Messrs. G. C. Pearson, C. F. W. Rendle, F. C. Briggs, and W. G. S. Cranmer.

A report on the work of The Institution of Gas Engineers was given by Mr. Rendle.

The President issued an invitation to all the members to visit Wolverhampton on the occasion of the Spring Meeting on a date to be announced, probably May 20.

Mechanical Handling

We have received from the publishers, Paul Elek, Ltd., a copy of the *Mechanical Handling Yearbook and Manual*, 1943, edited by Henry Pynegar, Consulting Engineer. It is a book of 400 pages and covers the subject exhaustively, from the aspects of machine mining underground, screening, conveying, and elevating plant, and industrial trucks and cranes. The price of the volume is 30s. 10d., post free.

A Meeting of the B.C.G.A. Executive Committee will be held on March 4, at Gas Industry House at 2 p.m.

The Analysis of substances and the examination of their behaviour by X-ray diffraction methods have become of considerable importance in the war effort. The Institute of Physics is therefore arranging a second Conference on the subject to take place in Cambridge on April 9 and 10 next. The provisional programme includes a lecture on "Future Developments in X-Ray Crystallography" by Prof. J. D. Bernal, and discussions on "Quantitative Treatment of Powder Photographs," "The Fine Structure of X-Ray Diffraction," and "Fine Broadening." A report is to be presented to the Conference on the progress made in the preparation of an Index to X-Ray Diffraction Photographs, for which the Institute has undertaken to be jointly responsible with the American Society for Testing Materials and the American Society for X-Ray and Electron Diffraction. Further particulars of the Conference and of the Index can be obtained on request from the Secretary of the Institute of Physics (*Temporary Address:* The University, Reading).

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

WORK OF THE GAS-WORKS SAFETY RULES COMMITTEE*

By F. M. BIRKS, O.B.E., Gas Light and Coke Company

IN 1928 the Federation of Gas Employers, having received a letter from H.M. Engineering Inspector of Factories dealing with matters connected with the suggested framing of regulations regarding the prevention of accidents with purifiers, asked for the assistance of the Institution. The Purifiers Sub-Committee of the General Research Committee was formed under the Chairmanship of Mr. C. S. Shapley. In the 1929 report of H.M. Chief Inspector of Factories attention was drawn to the need for the proper inspection of gasholders, and the Gasholder Sub-Committee, under the Chairmanship of Mr. T. Hardie, was brought into being. Both these Sub-Committees became full Committees in 1935–36, and in 1937 were merged into the Gas-Works Safety Rules Committee.

As the membership of both original Committees which came into being to supply a definite demand for reliable information was merged into a single new one, the continuity of the work was such that it is impossible to deal with anything that has been accomplished by the present Committee without including the work of the previous two Committees.

The designation as the "Gas-Works Safety Rules Committee" has been criticized as not being sufficiently wide to include all its activities, so perhaps it would be as well to consider from basic facts the name in relationship to the terms of reference—*viz.*, "that it was resolved to appoint a Gas-Works Safety Rules Committee to deal with all matters relating to rules for the safe operation of a gas-works."

If consideration is given to the early days of mechanical engineering from which gas engineering sprung, one can see how temperament as well as genius of those early technicians contributed so largely to the rapid technical development in the last 150 years. Let us take, for example, James Watt and Richard Trevithick, both men of outstanding genius, and whose combined contribution to engineering is the basis of all improvements in the steam prime movers.

James Watt, always a fearful soul, spent his life in exploring the possibilities of sub-atmospheric pressures, and to the day of his death fought shy of any pressure exceeding a few pounds per square inch above the atmosphere. Although it is possible that the work of this man of genius would have been lost to future generations had not others been available to provide the driving force necessary to get his ideas carried into effect, to the end of his life no one ever persuaded him that it was safe to use higher pressures, though undoubtedly he was well aware of the advantages which would accrue therefrom.

Richard Trevithick, the father of high steam pressures, was in character the other extreme, being naturally adventurous, and through the whole of his long and amazing life was never deterred by risks from embarking on any proposals which in his opinion would advance human knowledge and understanding.

It can be fairly said that these men typify extreme viewpoints, complementary to one another, and with the advance of time and the extension of knowledge it was realized that the advantages of a mechanized age could only be obtained by accepting considerable potential risks. These risks, great as they might be, if wisely and systematically subjected to regulations which experience had proved necessary, could be disregarded so far as the ordinary person was concerned. Accordingly future generations wisely steered the middle course. So far as the work of the men I have mentioned is concerned, the middle course is now defined by the Boiler Explosions Acts of 1882 and 1890, the first of which did not come into being until a number of severe boiler explosions had forced regulations upon the community.

The first boiler explosion of which particulars are available occurred at Greenwich in 1803. "It appears the boy that had the care of the engine was gone to catch eels in the foundation of the building, and left the care of it to one of the labourers; this labourer saw the engine working much faster than usual, stopped it without taking off a spanner which fastened down the steam lever."

It is of great interest that Trevithick took the precaution in subsequent boilers to have two separate safety valves and even proposed to have one locked up.

If consideration is given to any engineering activity where the work cannot be carried on without a potential risk to members of the community, sooner or later statutory regulations are introduced covering these risks. An example of this is the railways, which were originally almost free from any regulations, but now have probably the most onerous codes of any activity.

For many years the Board of Trade administered statutes relating to Merchant Shipping, the Mines Department the mining of minerals, and the Factory Department of the Ministry of Labour (formerly the Home Office) has watched over a hundred and one other industries. It is therefore a tribute to the Gas Industry that it took 116 years before the incidence of the accident rate with regard to holders and purifiers was sufficiently high to attract attention from Government Departments, who for years had been steadily increasing the standard of safety in other industrial undertakings.

The work of the earlier Committees and the contacts they had with the officials of the Factory Department emphasize the desirablity of this, or any other, industry being in a position at all times to advise Government officials as to the scope of regulations which will provide the adequate security for the individual with the minimum inconvenience and expense to the industry. Thus the work of the Committee may progress with advantage provided it is wisely and carefully carried out, holding rigidly to the middle course of not accepting as undesirable or dangerous anything that has not actually proved so when in commercial use, but utilizing experience gained on similar work. On this basis, simple but efficient rules can be formulated immediately they are required.

Gasholders

The closest attention was given to the important question of the periodic inspection of gasholders, which culminated in the publication of Maintenance Record Sheets for both water-sealed gasholders and those of the piston type (waterless). These have had a large sale by the Institution, and since the Factories Act of 1937 made inspections for water-sealed holders compulsory, record sheets have been in use at all gas undertakings. As a point of interest, these records now afford a valuable proof of the condition of holders prior to their destruction or damage by enemy action. This may become an important factor when settling war damage claims.

Recommendations were made as to methods of internal inspection of the condition of holder sheeting without having to put the holder out of action, and these later became incorporated in Section 33 of Factories Act, 1937, which is applicable, however, only to water-sealed holders.

Voluntary rules to be observed in the repairs of water-sealed holders were also published, which have since been generally adopted throughout the industry.

Rules for the inspection and maintenance of piston type (waterless) gasholders were formulated together with voluntary rules to be observed in their repair.

Although at that time few high-pressure gasholders were in use in the country, notes were also prepared for the inspection, maintenance, and repair of that type.

Detailed inspections and reports were made on several accidents to gasholders, from which useful and instructive information was obtained for the avoidance of similar troubles in the future.

When the Committee was merged in the present Gas-Works Safety Rules Committee a number of requests were received that the work on gasholders should be continued. So well established has this source of information on the subject become that a constant stream of requests for information and advice has been received by the Institution, and these all receive immediate attention so far as is possible. An investigation into the corrosion of gasholder sheeting below the water line in the cups of water-sealed holders was made, and a report duly published together with reports on causes of siphoning of sealing water from holder cups and the generation of hydrogen sulphide in the tank water.

The one type of holder of which we should be justly proud is the spiral guided, because it is so essentially British. Although the original design for column guided holders emanated from this country, they have been designed and built in nearly every country in the world. This is not the case with the spiral guided, which is seldom seen outside the British Empire. I have heard two reasons for this rather curious state of affairs:

(1) That the art of holder construction is not so developed in other countries as it is here, where the innate skill of the workers handed down from generation to generation enables difficult structures to be erected more easily than in other countries.

Having had many opportunities of inspecting holders in Europe and the Americas, it is my personal opinion that, with the possible exception of Switzerland, holders are built more accurately here than in other countries.

(2) That as there are gaps in the mathematical evaluation of the stresses in spiral holders, perhaps it is only the British engineer who is willing, where necessary, to rely on empirical methods, provided that experience has shown them reliable.

In 1934 exhaustive wind tunnel experiments were carried out at the Swiss Institute of Aerodynamics on a model of a column-guided gasholder as built by the Escher-Wyss Engineering Works of Zurich, and much interesting and useful information became available in consequence.

* Paper to the Southern Association of Gas Engineers and Managers (Eastern Section), Feb. 12.

In 1928, on a recommendation of the Research Executive Committee, the Council decided to approve the necessary expenditure to cover an investigation by the National Physical Laboratory of stresses in spirally guided gasholders. Wind tunnel tests on models were put in hand and the work was well advanced at the outbreak of war, when the wind tunnel was switched on to work of a more urgent character. From time to time opportunities have occurred of carrying the investigations further, and at present it has advanced to such a stage that the results are being edited in order that they may be presented in a form suitable for inclusion in text-books on the subject.

Although the final work on the exact distribution of the more complicated stresses may have to be further delayed, it is hoped that a preliminary report may be made shortly, as a number of new holders may have to be constructed after the war and such information, although admittedly not complete, would be of considerable use for immediate design purposes.

A fault in the smaller spiral holders became evident in the severe winter of 1938, when a number of them fractured the inlet or outlet mains due to the formation of ice in the tanks. This was investigated by the Committee at the time, and it may well be that further consideration may be required in this direction. The mains might be disposed concentrically to each other in the centre of the tank when the stresses would be converted from bending to torsional, while the chance of ice formation in the centre of the tank is much reduced.

Purifiers

The incidence of a series of explosions and fires during the process of discharging purifiers resulted in representations being received from the Factory Department of the Home Office, and after consideration the Voluntary Rules for the Safe Operation of Purifiers were published in 1938. The rules are based on the working experience of several gas undertakings, and are framed among other safety objectives to meet the requirements of the Factories Act, 1937. It will be observed that the rules have been framed to cover these requirements by prescribing precautions to avoid the liability of gassing of personnel and to obviate the risk of ignition.

It is of interest to note that reference was made to these Voluntary Rules in the Chief Inspector of Factories' Report for 1939.

Another activity undertaken was the preparation of a General Safety Code for Gas-Works. It was realized that a number of the large undertakings had printed codes of safe working of certain types of plant for use of the staff, but there was no uniform or general comprehensive code such as exists in certain industries and used in services such as railways, &c. Further, it was considered reasonable to suppose such a publication would be of advantage to young men entering an Industry in which few practical text-books are available.

Information concerning gasholders and purifiers had already been published and the drafts of memoranda were prepared for—

(*a*) Standard Safety Principles of Gas-Works Practice: Preface.
(*b*) The Layout and Working of Gas Boosting Plant.
(*c*) The Working of Waste Heat Boilers fired by Retort House Flue Gas.
(*d*) The Working of Boilers fired with Solid Fuel.

These were under consideration when the outbreak of war brought in its train so many urgent matters that, for the time being, further work was held in abeyance, but recently it was suggested that the time had arrived when the work could profitably be continued and a decision was taken to resume and complete them as soon as possible.

The publication by Mr. G. M. Gill (Cheltenham) in the "GAS JOURNAL" of Dec. 24, 1941, drew the attention of the Committee to the desirability of a code of precautions to be taken in the event of severe frost. In this country cold winters are only experienced in the South about ten times in a century, and many years have been known to elapse between really severe winters. It is thus possible for a large amount of plant to be installed without there being an opportunity to test out its behaviour when the temperature is low. Further, a generation of young engineers may grow up without experience in such matters. It was therefore decided to draft a scheme of precautions on the lines indicated by Mr. Gill, and it was duly published with the approval of the Council of the Institution in November, 1942.

In 1936, when the Factories Act was in draft form, it became apparent that the Bill contained certain clauses which it would have been impracticable to apply as they stood to gas-works and gas-heated apparatus. The Institution in conjunction with the Federation of Gas Employers therefore made representation to the Home Office on the major points of interest.

In the presentation of the Industry's case to the Home Office, care was exercised to state clearly the practical objections to these clauses, and at the same time submit alternative suggestions which, while achieving the safe principles sought in the Act, provided a sound working method.

The result of this policy was that agreement was reached with the Home Office on all points requiring elucidation, and limited conditional exemptions from specified requirements of the Act were obtained in respect of the following operations and of plant:

(*a*) Welding of water-sealed gasholders.
(*b*) Welding of wrought iron mains and services.
(*c*) Thermspray steam boilers. } These are sold by gas
(*d*) Steam tube ovens and hot plates. } undertakings and
(*e*) Multi-tubular boilers fired by town gas. } used by bakers, &c.

Wartime Activities

The incidence of the war brought a spate of hitherto unknown problems, upon which the Committee was asked for assistance. The first questions presented were those allied to the protection and operation of plant under war conditions, the most important of these being the suppression of glare from retort houses and water gas plant and the protection of engine rooms. This was followed by problems relating to the prevention of excessive damage due to hostile attack, the foremost of which was the method of dealing with gasholder fires.

On the development of hostile attack experience gained by undertakings which had suffered damage together with descriptions of how the ensuing difficulties had been overcome was the subject of a memorandum circulated in January, 1941, and afterwards revised and brought up to date in July, 1942.

Notes on Town Gas for Air Raid Wardens, published in 1940, was re-edited during 1942, as was also the National Fire Service *Operations and Training Notes*. These have since been circulated in their revised forms.

Considerable work was done on the camouflage of gas-works in conjunction with the Government Department dealing with this question. There was a difference of opinion in the Industry on the type of material most suitable for this purpose for use on the crown of gasholders. Fortunately the Committee had the great advantage of being able to hear the opinions of highly trained young engineers who had obtained a great deal of practical experience in dealing with many fires on holders, and their opinions carried the weight they rightly deserved. It was with regret we heard recently that an engineer of a provincial company, while dealing with a fire on a holder, had received injuries by slipping on the smooth surface of the crown. Most of the Committee will remember that when dealing with this matter the advantage of the non-slipping properties of certain materials was particularly stressed by one of our young informants.

From time to time the Committee has been called upon to deal with Government Departments as to matters which at the moment are outside the scope of a Paper of this type.

The value of purging by means of inert gases, for a long time after being first introduced into this country, was treated with, shall I say, a certain amount of suspicion. Recently it has come very much into favour, and here I would like to sound a note of warning. It was sponsored by the Gasholder Committee as a means of forming a cushion between gas and air, so that a vessel or other confined space could be changed over from one to the other without them coming into contact. It is to be hoped that its more extensive use will not lead to the idea that it is a perfect safeguard when dealing with an explosive mixture, because in such circumstances, with what medium the explosive mixture is forced out is not so important as ensuring that all points of discharge are guarded from the possibility of a naked flame.

General

The Committee is continuously engaged in sifting and sorting information of all types coming both from the Gas Industry and other industries. In this way much useful data has been compiled, and it has been possible to answer several enquiries from this source as well as to make recommendations of a general nature, as in the case of static electricity, which was referred to in the 1st Report of the Chairman's Technical Committee, 1939–1940.

Before concluding, one incident has come to my personal notice during recent months that may be of interest. The Gas Light and Coke Company has been experimenting for some years with various schemes to eliminate dust when discharging continuous vertical retorts, in order to improve the conditions for the workers. A trial plant was applied to a range of retorts and proved so effective that it was decided to fit a complete installation to a new retort house then being built. Great care was taken in the design of every detail, but unfortunately the type of retort in the new installation was different from that which the pilot plant had been applied and the significance of the change in layout was not appreciated. The plant worked extremely well, but some weeks after it had been started up an explosion shattered part of the induction mains, although no one was hurt; it also somewhat shook our confidence in the scheme. It was a tribute, however, that soon afterwards we were approached by the stokers, who stated that they had found the conditions so improved when it was working that they asked if it was possible to put in into operation again. Discussions took place in order to devise safety measures which, though simple, on being applied have so far proved satisfactory.

I would like to recommend to you a book which some of you may not have read, entitled *Climate and the Energy of Nations*, by S. F. Markham, because I venture to suggest everyone in the Industry should study this fascinating work, which so clearly indicates that fuel is the greatest factor in its civilizing influence that the world has ever seen. This fact cannot be stressed often enough.

This country, without its fuel supplies, cannot keep its place as a great world nation, so that the conservation of coal is of vital importance. We in the Gas Industry are therefore engaged in a calling both useful and essential. Is it too much to ask therefore that we should strive to make the amenities of our works as perfect as possible?

Improved ventilation, elimination of dust, protection from heat, discharging purifiers are all points capable of improvement in the future, on which the Committee can possibly be of assistance.

In conclusion we should pay a tribute to Mr. Thomas Hardie, under whose able and kindly Chairmanship so much important work with regard to gasholders was carried out. Since resigning the Chairmanship he has continued as a member of the Committee, the members of which all appreciate his wise and sage counsel. There are many members who, although they live some considerable distance away, at great inconvenience to themselves have made valuable contributions to the work, while the services of Dr. Braunholtz and Dr. Diamond have been invaluable.

Discussion

Mr. **J. M. Webber** (Croydon Gas Company, and Chairman of the Meeting) said how pleased everyone was that the President of The Institution of Gas Engineers was with them, and he called upon

Mr. **E. V. Evans**, O.B.E., who spoke of the effectiveness of the Committee dealing with gas-works safety and of the efficiency of its Chairman. He himself had watched and followed closely the Committee's work, and had pleasure in knowing that the foundations laid by Mr. Thomas Hardie as Chairman had been built upon by a sound and experienced engineer—he referred to Mr. Birks, the Author of the Paper they had listened to with enjoyment and appreciation. In his opinion the work of the Committee was of the utmost value, and it had become almost a bureau of information—a source of knowledge which would stand the Gas Engineering Advisory Boards in good stead. He was glad to pay tribute to the work of the Committee and of its Chairman.

Mr. **S. M. Milbourne** (C. & W. Walker, Ltd.) said that while the members of the Gas Industry were well aware of the considerable amount of work undertaken by the Gas-Works Safety Rules Committee in preparing reports and introducing schemes for the systematic inspection of gasholders and other gas-works plant, it was helpful to have this historical survey of the work carried out since 1929 by the earlier Committees which were subsequently merged into the Gas-Works Safety Rules Committee. It was in the section of Mr. Birks' Paper which dealt with gasholders that he was most interested, and he would like to confine his few remarks to this subject. In regard to the reasons why spirally guided gasholders had not been generally adopted in foreign countries, he thought that the more important reason of the two given by Mr. Birks was that referring to the "gaps in the mathematical evaluation of the stresses." One had only to read the criticisms in the technical Press following the early attempts of the late W. Gadd to define the stresses in the spirally guided gasholder to realize the great confusion that existed regarding the principles of stability on which this type of holder depended. The late F. S. Cripps, who was an authority on guide-framed gasholders, did not appear to be prepared to give the spiral gasholder his blessing, and there was no doubt that his criticism of the mechanical principles enunciated by the patentee did much to retard the progress of this type of holder, both in this country and abroad. The controversy which took place between Mr. Gadd and Mr. Cripps concerning the mathematical computation of the stresses extended over four years from 1888 to 1892, and many eminent engineers at that time took part in these discussions. Had it, in fact, not been for the adventurous spirit of a very few British gas engineers about the year 1890, it was quite possible the great advantages of the spiral system of guiding gasholders might have lain dormant for a long time. As far as the question was concerned as to whether the art of gasholder construction was developed in other countries to the same extent as it had been here, some striking examples of the skill of the workmen in this country during the early days of the Industry might be found on reference to the older drawings now in possession of contractors. Some of these drawings of gasholders which were intended for the works gave practically no details of construction, and there were instances where little more than overall dimensions of the lifts appeared. At the present day most works drawings were fully detailed and dimensioned, but there was still required a considerable amount of skill and experience on the part of the workmen if a satisfactory job was to be made of a spirally guided gasholder.

Whatever might be the reactions of engineers in foreign countries regarding spiral holders, it was certain that this type was now the most popular in this country, and it was therefore very gratifying to observe from Mr. Birks' Paper that experiments had been conducted at the National Physical Laboratory with a view to investigating the stresses in these important structures. He was sure that all those who were responsible for the design or maintenance of spirally guided holders would welcome the preliminary report when this was published.

Mr. **H. Dobson** (R. & J. Dempster, Ltd.) paid tribute to the work of the Committee and its influence in drawing closer together the gas engineer and the contractor responsible for storage plant.

Dr. **G. E. Foxwell** (Clayton, Son, & Co., Ltd.) commented on the technical and the personal aspects of safety, remarking that what might be safe for one man might be fearful and dangerous to another. And he suggested that the engineers who were specifying holders should state their requirements in regard to access to the crown—*i.e.*, types of ladder—clearly and unmistakably.

Dr. **S. Pexton** (Gas Light & Coke Company) spoke of the use of water gas plant as standby boiler plant, for it must be realized that gas-works were highly dependent on steam—that in fact they could not "get far without steam." And he directed thought to the use of water gas plant as producer gas plant, and the application of the producer gas made to the generation of steam in waste heat boilers. They could admit a restricted supply of air to the generator, saturated at a temperature of 60°C. with steam, make producer gas, and burn with an excess of secondary air. By having the waste gases containing 6% of CO_2 and 14% of O_2 or thereabouts it was easy to ensure safe and uniform temperature conditions. After all, a water gas unit of a capacity of, say, 2–2½ million cu.ft. per day would in normal operation raise 7,000 to 8,000 lb. of steam an hour. But in normal water gas operation it was in fact steam-raising for only 40% of the time. On producer gas working the hourly rate of steam-raising could be considerably increased—up to, say, 12,000 to 15,000 lb. per hour.

Which brought him to the more fundamental consideration that water gas plants were usually employed as peak load units; and it was not unknown that the meeting of peak loads might be delayed simply because the capacity of the works boiler plant for steam was saturated at the very time when the additional steam was needed to bring the water gas plant into operation to cope with the peak loads.

Now the use of water gas plant as producer plant for steam generation would in fact provide as it were a "self-starter" to peak load water gas production. Moreover, to start-up a water gas plant on air alone was to invite clinker troubles. On the other hand, if the plant was started-up as a producer, the maximum temperature in the fuel bed could be predetermined.

Members who joined in the discussion emphasized the importance of providing adequate "safety staircases" for holders—particularly for spiral-guided holders in view of the practice of oil-filming of the water-line—and stress was laid, too, on the desirability of making fully available information on mistakes made and accidents which occurred, so that benefit might be gained by free and frank disclosure and discussion on what actually was happening.

Mr. **E. G. Stewart** (Gas Light & Coke Company) remarked that, as a member of the Committee, it was naturally with diffidence that he suggested the work done by it was perhaps insufficiently appreciated. But it was most desirable that the reasons why accidents occurred should be thoroughly understood by the young engineer entrants to the Industry, and that they should appreciate the nature of the precautions taken.

A vote of thanks to Mr. Birks was proposed by Mr .**W. Grogono** (Croydon Gas Company), seconded by Mr. **D. C. Cross** (Lea Bridge & District Gas Company), and carried with acclamation.

National Gas Council

A Meeting of the Central Executive Board of the National Gas Council was held on Feb. 9 at Gas Industry House. Sir David Milne-Watson, Bart., LL.D., D.L., presided.

It was agreed to nominate Mr. J. H. Cadman to represent municipalities on the Standing Committee of the Post-War Planning Committee which has been set up to deal with methods of charge and statistics.

Mr. T. Brown, Director and General Manager of the South Suburban Gas Company, was appointed to take the place of the late Mr. Stephen Lacey as one of the representatives of the British Commercial Gas Association on the Board.

A report on the general coal position was submitted. It was reported that, in accordance with the decision reached at the previous meeting of the Board, a letter had been addressed by the Council to the Minister of Fuel and Power against the recent general increase of 1s. per ton in the price of coal. A meeting was reported on Feb. 3 between the Demurrage Committee of the Conjoint Conference and the Special Demurrage Committee of the Railway Companies, in order to discuss the suggestion that arrangements might be come to whereby demurrage would be computed not upon individual wagons but by averaging. It was reported that a small sub-committee consisting of Gas, Electricity, and Water representatives had been set up to meet a sub-committee of the Railway Companies' Special Demurrage Committee.

It was reported that the War Damage Committee, after having given full consideration to the White Paper issued by the Government with regard to War Damage to Public Utility Undertakings, had forwarded a list of points to the Treasury with regard to which they felt that further elucidation was necessary, and the Committee met the officials of the Treasury on Feb. 4. Mr. A. J. Mumford, who had acted as spokesman for the Committee, submitted a report.

It was reported that the eleventh annual meeting of the Conjoint Conference of Public Utility Associations had been held on Jan. 27. Lord Falmouth had unanimously been re-elected President for the ensuing year, and Lord Pentland, Sir Francis Fremantle, and Sir David Milne-Watson had been re-elected Vice-Presidents. Mr. H. C. Lamb, of the Manchester Electricity Department, had been elected Chairman of the Council of the Conference for the ensuing year, and Mr. H. Berry, Chairman of the Metropolitan Water Board, had been appointed Vice-Chairman as representing the Water Interests, and Mr. A. W. Smith re-appointed Vice-Chairman of the Council as representing the Gas Industry.

The annual general meeting of the Council was again postponed in view of wartime conditions.

The next meeting of the Board will be held on March 9.

FUEL ECONOMY IN GAS WORKS

No. 4

We are indebted to the Severn Valley Gas Corporation, Ltd., and Gas Consolidation, Ltd., for permission to reprint a series of notes specially compiled for them by G. M. Gill.

Continuous Vertical Retorts

IN looking after an installation of continuous vertical retorts, the Author would suggest that the first thing to do is to prepare a list of data to be obtained daily, weekly, and monthly, or at intervals decided upon after due consideration. A log sheet should then be prepared to show such details, and also a list of data to be regularly posted where the men on the plant can examine such figures and results. It is surprising what improvements can be shown if the interest of the men is aroused in this way.

The employment of an adequate technical staff to make the necessary tests and observations and then act upon the information so gained is possibly the best investment which the undertaking can make. Certainly, one of the first things to do is to become equipped with all the necessary instruments so that the management does not work blind. While the operation of a continuous vertical retort installation lends itself admirably to a system comprising regularity of routine with the assistance of a technical staff armed with adequate instruments, the same is true also of retort house management generally.

Working of the Producers

All those with experience of continuous vertical retorts stress the importance of producers and their operation, as the efficiency with which these are operated makes so much difference to the results. With producers large enough it is possible to use upwards of 25% of breeze without in any way spoiling the results. In such cases step plates or sloping bars, if used, must be suitably spaced to enable breeze to be used without the danger of it falling through into the ashpit whenever the producer is being cleaned. In other cases it is much better to burn the breeze under boilers. It is mainly a question of the capacity of the producers for the work these have to do.

The quality of the producer gas is important, and should be maintained at as constant a composition as possible by regular attention to the necessary routine. Thus, one should aim at a content of 25% to 30% CO and check this by regular testing. Alternatively, a close scrutiny of CO_2 in the producer gas by using a CO_2 recorder is very helpful. Clean the fires often enough but not too often. It can sometimes be a greater fault to disturb the grate than to leave it untouched. For instance, at one works the producer fires are only cleaned every 48 hours. At this particular works the fuel results are excellent. It is a question of the quality of coke used and of its condition which should decide routine in this matter.

All operators agree that it is easier and better to work with induced draught, which is usually introduced where waste heat boilers are installed, as this gives constant draught conditions throughout the plant. When working with natural draught, the quantity of primary air to the producer is dependent upon the chimney pull, which varies with the temperature and atmospheric conditions and is therefore not nearly so dependable as induced draught. Accordingly, it is advisable wherever possible to install a fan at the outlet of the waste heat boiler, so helping materially to control with a nicety the pull on the plant and the maintenance of the correct pressure in the producer gas flue. If practicable, it is advisable to maintain the producer gas flue at a slight pressure and so prevent air infiltration. Up-to-date practice suggests the importance of using a pressure recording gauge at this point.

It is necessary to clean the producer gas offtake flues regularly, and to ensure that the producer charging door is properly closed; and, further, that the producer itself is filled often enough to maintain the correct depth of fuel, which should never be allowed to fall below the level of the curtain wall.

It is important in small vertical retort installations to have a careful regard to the size of the producer in relation to the number of retorts at work. For instance, in the summer the load may be small with few retorts at work, at which time the producer may be too large for its work. In such a case the travel of air is so slow that the producer is not working at anything like the temperature required to bring about a thorough conversion of CO_2 to CO and of steam to hydrogen. As a result, the quality of the producer gas is poor and likewise the fuel results.

In such circumstances it is important to make regular tests of the producer gas and to know what is happening. If the producer gas is poor, it is advisable, if possible, to fix a suitable dummy lining, after consultation with the builders, to the inside of one of the producers, and also it may be advisable, but not necessarily so, to brick-up a portion of the grate area. By this means the smaller producer can be used in the summer and the larger in the winter. In some small plants the producers have already been arranged on these lines.

At one small works with a continuous vertical retort plant with which the Author is concerned it is the regular practice at certain periods of the year and under certain conditions of output to use more coal and to pass a proportion of the coal gas into the producer, which as a result uses less coke and correspondingly makes more coke for sale per ton of coal. If coke is in good demand and selling at a satisfactory price in relation to the cost of coal, this method reduces the cost of gasmaking and also enables the demand for coke to be met. At the same time, the thermal efficiency of the working improves as a result. A change can readily be made at short notice once the necessary technique has been ascertained by experiments.

The Author would also suggest that in the matter of water or steam supply to producers it is good practice to work with dry ash pits and to use the correct amount of water or steam to produce the best results, as discussed at some length earlier in these articles.

Attention might here be drawn to the fact that excess water on step or sloping bar grates has the effect of soaking the coke close to the grate and this then becomes too wet to be burnt, and as a consequence finds its way in due course into the ashpit as unburnt coke.

Producer fuel should be weighed and the result recorded per ton of coal carbonized, and as lb. per 100 lb. of coal.

Regulation of Heats

The importance of keeping a close check on the producer gas flue pressure by using a pressure recorder has already been stressed, and also the advantage of using a fan on the waste heat boiler instead of having to rely upon chimney draught. It is imperative to watch and maintain combustion chamber temperatures, which should be taken daily. For this purpose a suitable pyrometer is essential, as are also a pressure-vacuum indicator reading to $\frac{1}{100}$ in. W.G., a draught recorder, and an Orsat apparatus.

Draught conditions should be checked regularly throughout the plant. A draught indicator also assists in finding stoppages, flue dust deposits, and leakages in flues. A draught recorder is also a useful instrument in making records of chimney pull and in investigating faults more easily corrected with the help of an instrument of this kind.

Regular tests of the waste gases are essential. Tests are also advisable after making a draught alteration. A slight excess of oxygen should be aimed at an and excess of CO avoided, which latter may indeed give rise to high temperatures in collecting flues, where oxygen may be present. The regulation of the plant should be good enough to enable waste gases with a content of 17–18% CO_2 to be maintained. Be careful not to use too much chimney draught, and avoid working higher temperatures than actually required, as both faults can waste a great deal of fuel. Do not overlook the claying up of all inspection holes, failing which much unwanted air can be admitted.

It is most important to maintain a regular flow of coal of the correct quantity through the retorts. Regular rodding is essential. Some specify hourly rodding and some a shorter time. It is a question of the type of coal being used. It is important that the management should specify a definite time, and also arrange for the use of the right length and diameter of rods.

The auxiliary coal hoppers are usually provided with indicators to show the quantity of coal passing into each retort. It is advantageous for these indicators to be used and the travel of coal to be watched and noted, failing which it can readily happen that the quantity of coal carbonized in a particular retort can be seriously reduced. Further, it is important to keep these indicators in good and workable condition. While the auxiliary hoppers can form a good guide to the coal used in each retort, the stock in the main storage hoppers should be taken weekly and so obtain the quantity of coal carbonized for calculating the weekly results.

If sticky coals have to be used, and, in fact, with any good coking coal, it is practicable and advantageous in some cases to use up excess stocks of fine breeze—it must be very fine—by returning a proportion of this to the coal hoppers and allowing it to mix with the coal. It has the effect of decreasing the tendency of charges to hang up and is, in fact, converted to good coke, provided, of course, that the coal is suitable.

It is helpful to use a stroke counter to note the main bar strokes of the extractor gear, while the extractor rate on each retort should be checked regularly. These may vary for a number of reasons, owing to wear, getting out of alignment, or to variation in the speed of the driving unit. The correctness or otherwise of the steam-reducing valve and of the steam jets should also be checked at regular periods. It is advisable to keep a check also on the quantity of coke extracted, particularly with a change of coal. Further, a close eye should be kept for incompletely carbonized coke, and so enable the necessary adjustment to be made without loss of time.

Gas Results

To obtain the best results in gas made per ton and per retort there is much scope for good operational methods. One important rule is to avoid overpulling to reduce the calorific value of the gas. It is advisable to maintain level gauge or a slight pressure at the retort off-take, and to regulate gas quality by using more or less steam. As in the case of horizontal retorts, air infiltration must be prevented. The best and simplest method to prevent this is to put all retorts under pressure every day, or at least regularly and often, and then to note and stop any leaks in the top and bottom ironwork, and also into the combustion chambers. These latter can be noted and repaired when the retorts are down for scurfing.

Admission of air and inerts into the gas reduces the amount of steaming which would otherwise be possible in making gas of a given calorific value. Thus, every 1% of added inerts and air reduces the make per ton by 1.4 therms per ton. Care should therefore be taken not only to avoid admitting inerts into the gas, but also to limit as far as possible the amount of air used for purification.

Air infiltration can also be checked by daily testing the gas for CO_2, O_2, and N_2, the CO_2 in the gas indicating whether the steaming is excessive or deficient. Further, a complete gas analysis should be made frequently to note the various constituents in the gas, as these give a clear guide as to other irregularities. For instance, if hydrogen percentage is low it would suggest low temperature due to steam not being decomposed, particularly so if the CO_2 is high.

A regular inspection should be made of the orifice plates or nipples in the steam line, to ensure that these are in order and that there is no restriction at such points.

It should not be overlooked that a recording pressure gauge is necessary at the inlet to the retort house governor. Without this it is difficult to control the plant intelligently.

A small test holder—5 cu.ft. will do—is a useful piece of apparatus for sampling crude gas on the plant when making investigations. It is necessary, of course, to remove the tar from the gas in a wash bottle.

The scurfing of retorts and the importance of rigid observance of the scurfing programme are stressed by all good and experienced operators. Any plant operator who has got badly behind with his scurfing programme and then has a heavy load to meet is not likely to forget the experience. Delay in scurfing retorts is bound to cause a decrease in the output of gas from such retorts, as it invariably causes a reduction in the quantity of coal passing through the retort, so reducing the output of gas, while it also wastes fuel, as the heat does not pass readily through the scurf. In fact, nothing upsets the output of gas more than delays in scurfing retorts.

After scurfing, it is most important to patch any cracks or holes in the retort walls before the retorts are again put to work.

The augering of the gas offtake pipes at regular intervals—some specify every shift, others every 24 hours—must not be neglected.

Waste Heat Boilers

The waste heat boiler is a most important section of the plant, and has played a big part in bringing vertical retorts to their present high state of thermal efficiency. For the best results it is essential to be equipped with the necessary instruments to show the results being obtained.

As a consequence, most installations of any size are equipped with:

1. Recording pyrometer for inlet temperature.
2. Dial thermometer for outlet temperature.
3. Draught indicator on inlet and outlet of the boiler.
4. Chemical apparatus necessary to test the hardness of the feed water.

But the following additional instruments give valuable information:

5. Steam meter, or alternatively V notch flow recorder in feed tank, or, as another alternative, as water meter to the feed tank.
6. CO_2 recorder.
7. Draught recorder on the waste gas flue.

Good use should also be made of the Orsat apparatus (specified elsewhere) to check the CO_2 and O_2 content of the gases entering the boiler.

To get the best results, the waste gases should be analyzed at the boiler inlet to ensure that these are not liberally loaded with air, in which case such leaks must be traced and stopped. Again, temperature of the waste gases on the inlet and outlet of the boiler must be constantly checked. If the temperature is too low on the inlet it points to air infiltration, the remedy in which case is obvious. Further, if the pull on the fan has to be increased it would suggest dirty tubes in the boiler, to prevent which it is advisable to clean these tubes daily. On the other hand, if the temperature of the waste gases on the outlet of the boiler is too low, below, say, 230°C., then this should be corrected by plugging up some of the firetubes, as otherwise corrosion of the tubes, tube plate, fan, and outlet ducts is likely to occur.

Should the boiler efficiency drop and less steam be produced than anticipated, this may be due to deposits on the tubes, owing to the water softening being defective.

In cases where a producer gas flue is run to the inlet of the boiler for auxiliary firing, care should be taken to ensure that any dampers or valves are quite tight when closed. If this is not done there is a distinct possibility of producer gas being wasted by being burnt in the waste heat boiler, so producing unnecessary steam.

All these possibilities point to one thing, and that is the necessity for the taking of great care on the part of the management, which, however, is seriously handicapped without the necessary instruments and staff to note the actual results. Even these are of little use unless the management is fully qualified to interpret the significance of all such tests.

Provision should be made for carrying out the necessary work for keeping the waste heat boiler in good working order. The importance of this becomes particularly noticeable whenever it is shut down.

Bench Brickwork and Radiation Losses

It is well worth while to make a particularly close examination of the bench brickwork and stop all signs of air infiltration. Such examination will be assisted by tests of producer gas and waste gases at likely points. All brickwork should be pointed where necessary and cement washed, which latter will stop leaks not visible to the naked eye. The existence of air or gas leaks in the brickwork will have a bad effect on the results. Radiation losses can be very considerable, particularly on the smaller plants, as the result of which, coupled with the large size of units in comparison to the output of gas, the amount of coke made for sale is likely to be small, especially during the summer months.

In one small plant with which the Author is concerned, a considerable amount of improvement in respect of coke made for sale was brought about by increasing the amount of insulation material on the outside walls of the bench. This is best done by bonding in good class insulation bricks on the outside walls. It is suggested that a thickness of at least 4½ in. of insulating bricks should be added in this way. This method is superior to the use of insulating composition or of insulating bricks not tied into the brickwork, as a space can develop between the bench brickwork and the insulating material, with the result that a space of this kind can have a chimney-like effect and create a draught of cold air to pass upwards between the bench and the insulation material. Besides, insulating composition is likely to hide cracks which develop in the brickwork.

Maintenance of Tools

One of the most important duties of the management is to ensure that all retort house tools are of suitable design and type, and that these are kept in first-class condition. The provision of two sets of tools, one set in use and the other in the blacksmith's shop, ready for changing over every Monday morning, is an excellent system, which assists to keep the men in a good frame of mind and ready to give of their best.

In conclusion, the Author cannot do better than refer those who are concerned with the control of Continuous vertical retort plant to the excellent Paper read by Mr. T. C. Finlayson on "The Scientific Control in the Retort House and its Contribution to National Fuel Economy" before The Institution of Gas Engineers on June 10, 1942 (see "GAS JOURNAL," **238**, p. 408).

Wandsworth and District Gas Company

Annual Meeting

The Annual Meeting of the Wandsworth and District Gas Company was held on Feb. 9 on the Company's premises at Wandsworth.

Mr. Frank H. Jones, M.Inst.C.E. (Chairman and Managing Director), said that it was a matter of regret to the Directors to find in May last that it had become necessary to increase the price of gas by 1.5d. per therm. That had been done after the Ministry of Fuel and Power had considered all the working details of the Company and agreed that such an increase was fully justified. Their gas, in price, still compared favourably with the rest of London and provided a fuel that was economic and indispensable to the consumer, whether domestic or industrial. Moreover, its by-products were invaluable to the nation both in peace and in war.

In spite of difficulties, the Company's ships had been able successfully to carry a large proportion of the coals required by the Company. All the works had been maintained in as high a state of efficiency as circumstances allowed. That presented considerable difficulty, but their policy had always been, and would continue to be, to maintain the works and plant as efficiently as circumstances permitted. Their sales department had been working well and the industrial section had been particularly busy.

The Company had done everything in its power to co-operate with the Ministry of Fuel and Power in its drive for fuel economy. They had worked in close contact with the electrical undertakings throughout the area and remained on terms of cordial co-operation with their friendly opponents.

In conclusion, after paying a tribute to the loyalty, skill, and application of their staff in these very difficult times, he said that proprietors would have noticed with pleasure that it was recommended that the dividend on the Ordinary stock should be increased as compared with that paid for the previous year.

AMERICAN GAS INDUSTRY IN WAR*

By ERNEST R. ACKER
President, Central Hudson Gas and Electric Corporation

SINCE the declaration of war it has been my privilege to act as Chairman of the A.G.A. Committee on War Activities and to work closely with the various sections and committees of the Association, and particularly with the Headquarters Staff in New York and Washington, on many matters of importance to the Industry and its war effort. In this work I have also had the opportunity to meet with the representatives of various government agencies and in all cases have been tremendously impressed with the sincerity, ability, and singleness of purpose with which these men are tackling the war problems. I am convinced that by and large the men upon whom the country is depending to administer its war agencies are guided by one primary motive in their consideration of all problems—the strengthening and furtherance of the war effort. The response of the Gas Industry has been notable, and I am confident that the Industry will live up to the spirit and letter of the commitment made by President George S. Hawley to the President of the United States on Dec. 10, 1941, when he pledged, on behalf of the Executive Board of the American Gas Association, the "full co-operation of the gas utility industry of America to our Government in the national crisis."

The Committee on War Activities is composed of only six members broadly representative of the natural and manufactured gas industries on a regional basis, and was so constituted to provide for quick decisions and prompt action in the present emergency. The functions of the Committee on War Activities may be briefly summarized as follows:

1. To take action promptly in an emergency on matters originating with Government war agencies, the Executive Board, or members of the Industry.
2. To promote the co-ordination of the war activities of the several sections and general committees of the Association.
3. To consider, authorize, and sponsor any war activities which may be proposed by these groups, and to initiate or assign to section committees any activities which the committee believes to be essential.
4. To make recommendations to the Industry and to take the necessary steps to assure their full consideration by member companies.

The committee has not attempted to pre-empt the functions of existing committees or to duplicate activities already being effectively conducted. It has received the wholehearted co-operation of the officers, headquarters staff, sections, and other committees of the Association, and has achieved its purpose only because and to the extent that the full facilities of the organization were available to it. The committee has little to report of its own accomplishments—it has much to report of the accomplishments of the Association as a whole.

The Industry is now being asked to co-operate with the government in the promotion of fuel conservation through a public educational programme. In this connexion representatives of the Industry, including the Chairman of the Publicity and Advertising Committee of the Association, have met with officials of the Power Branch of the War Production Board, and have agreed to draft suggested advertising material for the Gas Industry for submission to the government agency.

Early in its deliberations the Committee on War Activities approved the creation of a special committee of the Residential Section on co-ordination of the Gas Industry with the National Nutrition Programme. This activity, together with the outstanding work of our home service people, has received unusually high and spontaneous commendation from governmental agencies, and demonstrates clearly the value of the organization and promotional work on home service which the Association has sponsored for many years.

In January of 1942 the committee urged the creation of a salvage bureau by the Association, which was immediately established. This programme was undertaken prior to the initiation of the War Production Board activity and has resulted in the exchange of large quantities of materials and equipment by member companies. Lists of surplus materials have been furnished to the War Production Board, but to the best of our knowledge have not been circulated by that agency. It is interesting to note that several companies which opposed the submission of surplus material lists in the early part of the year have recently obtained needed materials or equipment through the use of such lists. The salvage bureau has made surveys of the availability of used turbo blowers and coal gas ovens for the War Production Board, and has been instrumental in obtaining materials and equipment for several cantonments and for numerous industries producing war materials.

Many gas company executives are gravely concerned with the increased intensity of the competitive activities of certain electric manufacturers with governmental agencies concerned with housing projects. We believe that their activities have already resulted in uneconomic decisions by certain federal agencies, and that their representations are based on unfair comparisons and unsound reasoning. To combat this situation the committee requested the appointment of a special committee to assemble material in co-operation with manufacturers of gas appliances, as to weights of critical materials required for various combinations of utility services. Figures as to electrical installations were developed by combination gas and electric companies interested in presenting factual and defensible data. The results to date indicate that the use of proper gas equipment offers possibilities for considerable saving of critical materials in war housing projects, and the committee will shortly determine the manner in which this data can be most effectively used.

One of the outstanding accomplishments of the Association in which the committee has been involved was the publication by the Technical Section of the handbook, *War Protection of the Gas Industry*, which has recently been completed and put in the hands of all member companies.

It seems obvious that all companies will experience increasing difficulty in retaining the services of expert employees of draft age. A responsible representative of the Manpower Commission recently stated flatly to a group of public utility representatives that they would within the next few months find it impossible to retain the services of single men (and within one year, of married men without children) under 45 years of age, unless they could convince the Draft Boards that the services of these men were indispensable to the war effort. He further stated that the Manpower Commission will not in the future agree that any man is in a key position when a new man can be trained for the job within six months. He cautioned the utilities that all employers should begin immediately to train men who would probably not be subject to draft, to replace those who are certain to be called within the near future. In the meantime the Committee on War Activities has been working closely with the Association's Committee on Personnel Practices to improve the status of gas company employees with the Selective Service Board and Manpower Commission. We are informed that a list of critical occupations in the Gas Industry is in process of preparation by the Manpower Commission, together with similar lists applicable to other industries declared to be essential to the war effort. Representatives of the Manpower Commission have refused to allow our representatives to collaborate in the preparation of the Gas Industry list on the grounds that other industries would request that same privilege, and the Commission would be swamped with industry representatives each demanding attention and prompt action. Unfortunately, some Draft Boards refuse to grant the Gas Industry the same status as the electric because of the absence in our case of a specific Occupational Bulletin containing a list of critical occupations.

The Office of the Petroleum Co-ordinator for War has directed certain questions to the Association looking to the conservation of oil in water gas production through the substitution of low grade gasoline or liquefied petroleum gases for present enrichment oils or through reduction of the B.Th.U. content of the gas. This matter is under the joint review of the Committee on War Activities and the Special Committee on Oil Conservation of the Technical Section.

Based on information requested from the Consolidated Edison Company of New York on the results of their experiments with the use of 30% tin content solder, the Tin Branch of the War Production Board made inquiry of the Association's Washington representative as to whether a reduction from the 40% content now authorized for meter repair work to 30% was now in order. At the suggestion of the Committee on War Activities, officials of the Tin Branch were advised that the Industry would immediately undertake additional tests to determine whether a 30% tin content solder could be used advantageously, and that the committee would be glad to advocate amendment of the Tin Limitation Order if the results of such tests were satisfactory. The Industry has been fully advised as to the formula and technique used by the New York company, and the results of numerous tests have been under review by the Distribution Committee of the Technical Section. Companies which have used the new solder successfully and who are satisfied with its performance report that the use of the new formula requires careful training of the meter shop personnel, and shows a reduction in tin usage only after operators have become thoroughly proficient in the new technique. Other companies report no success in obtaining tight joints or in reducing the total quantity of tin used—so that to date there is no unanimity of opinion, and the Industry is in the position with a governmental agency of being unable to reach an agreement within its own councils on a matter involving the use of an extremely critical material. I feel that this is a matter which merits the attention of the first executives of the Industry. An important executive of the WPB recently warned a meeting of public utility representatives in Pennsylvania that a year from now the restrictions under which we are now operating will seem mild by comparison with those which will be in effect at that time.

Association Headquarters is daily besieged by war agencies requesting information of every conceivable kind concerning the Gas Industry. Much of the information requested is a duplication of information already furnished to other governmental agencies, but it is rarely possible to persuade one agency that it should obtain the information form the other. It has been said that democracy can work only in the presence of pressure groups, and one supposes that rivalry for power is human.

* Extracted from a Paper to the American Gas Association, October, 1942.

COMPLETE GASIFICATION BY TULLY PLANT*

By A. E. YEO, A.M.I.Mech.E.

THE simplest design of plant for carrying out complete gasification is that in which a carbonizing retort is superimposed on a water gas generator, and in which the coal gas and water gas are mixed in the process of manufacture. In contemplating the working of such a plant it is an advantage to consider the lower portion of the generator separately from the superimposed retort, as this lower portion is in all respects an ordinary water gas generator, functions in the same manner, and is worked to a similar cycle of blow, up run, and down run.

If it were possible to maintain a sufficiently high temperature inside a retort and to pass enough heat through its walls, it is obvious that this cyclic working would not be employed for the manufacture of water gas and complete gasification plant would take the form of a vertical retort. The efficient manufacture of water gas, however, demands not only an incandescent bed of coke, but involves the abstraction of a large quantity of heat from the fuel bed, the regeneration of which can only be satisfactorily accomplished by intermittent air blasting. Only if oxygen is available in place of air can complete gasification be satisfactorily carried out without intermittent working.

It is surprising how often water gas plants are worked at too low a temperature, either through over-steaming or insufficient blow. It is not generally realized that of the 295 B.Th.U. in a cubic foot of water gas, approximately only two-thirds are obtained from the carbon which combines with steam to form it. The balance of one-third plus the heat losses in manufacture have to be obtained from the sensible heat of the fuel bed. It has to be generated and stored there during the blow and yielded up during the run to balance the thermal equation.

At the temperature necessary for the manufacture of water gas the waste products of the blow must leave the fuel bed at a high temperature. Formation of carbon monoxide is inevitable and the waste gases contain a considerable percentage of combustible gas. There is consequently a fairly high thermal loss unless some means of recovery is employed. Fortunately this heat can be efficiently recovered, especially in a complete gasification plant where a portion of the waste gases can be burnt around the carbonizing retort, and the remainder utilized in a waste heat boiler to produce the whole of the steam required for the water gas reaction and also for the blower engine. The provision of a waste heat boiler thus effects considerable economy and also renders a plant self-supporting as regards steam requirements.

In complete gasification plant of the type under consideration, a further economy is obtained by passing the water gas of the up run through the coal in the superimposed retort, and thus making use of its sensible heat to assist carbonization.

The development of this form of complete gasification plant has put it beyond the definition of an auxiliary plant. Its thermal efficiency and also economic considerations make it a process of gas production which enters into the category of principal plant, and as such, using coal or coke, or any proportion of the two, gives a flexibility which substantially assists in the determination of gas production policy.

The extent to which complete gasification can be employed depends largely on the market available for coke. Obviously it does not pay to use coke for the manufacture of water gas if it can be sold at a price which is more remunerative ; especially if it is disposed of for purposes that do not tend to restrict the use of gas. Alternatively it does not pay to produce coke to be disposed of in an unsatisfactory market, and it is in such cases that 100% complete gasification is advocated. The gas produced is low in inerts, consistent as regards calorific value, gravity, and composition, has a high flame intensity and is in every way suitable for distribution.

By adopting 100% complete gasification the handling of coke is entirely eliminated and a correspondingly less amount of coal has to be handled and stored. Gasmaking is usually restricted to not more than two shifts per day and the works are closed down for the remainder of the day. Seasonal and daily fluctuations in demand are met by varying the daily working period.

It is many years since automatic operation was introduced for plant of this type, and it is rare now that hand operation is ever considered. By employing an accurately timed mechanical operating machine for the changing over of the valves the difficulties associated with intermittent operation are eliminated, and a uniformity of working and of results is obtained which was hitherto almost impossible. Moreover the labour required is reduced to a few minutes per hour for charging, apart from daily cleaning of the fire, &c.

A complete gasification plant with mechanical operation and waste heat boiler gives a compact self-steaming gasmaking unit ideally suited for its purpose of economical gas production with a minimum of by-products to handle, store and dispose of.

It will, I think, be admitted that over a considerable period, and more so during the War years, the trend in the Gas Industry has, except where the coke market is very favourable, been to produce more gas and less coke from the coal used and to lower the calorific value to achieve that end. Also I think one of its major purposes is for use in conjunction with other gasmaking plant. For this purpose it is superior to straight water gas as the plant, although designed for the use of coal, has the advantage that it can also use coke or mixtures of coal and coke with the utmost efficiency. When using coke the calorific value of the gas produced is about 295 B.Th.U., consequently any quality between that and 350 B.Th.U. is obtainable. The plant thus not only serves to control the coke market, but its flexibility enables the most economical use to be made of retort installations, and frequently renders unnecessary the keeping of standby retorts under heat.

Where mixed gas of 450 B.Th.U. is sent out a variation of 20%–25% in demand can be accommodated simply by changing from coal to coke or *vice versa*. With the distribution of lower calorific value gas the variation in the load which can be met in this manner increases rapidly. The disadvantage of using coke in a complete gasification plant is the same as with a water gas plant—namely, that the fuel has to be handled several times, first as coal and then as coke, and there is the loss of heat due to quenching. By using coal in a gasification plant these losses are avoided.

Where plants are installed to work in conjunction with other gasmaking plant it is usual to construct the waste heat boiler for the same working pressure as the works boiler and to interconnect the two, thus using the surplus steam usually available to economize fuel on the works boiler.

In the course of a note on the Tully gas plant at Cowdenbeath Mr. **J. J. Scott** said the plant had been in use for over seven years, and was producing no less than 72% of the total gas output.

Their experience during this period had beyond doubt satisfied his Directors and himself. The plant had given the utmost satisfaction in its performance, had not suffered any breakdown, and had been free from any expensive repairs and maintenance costs. The original internal brickwork linings and retort section were still in use and gave evidence of further satisfactory service.

The guarantees given for the plant performance were:

(1) To produce from coal or coke 140 therms per ton.
(2) To produce 300,000 cu.ft. per day.
(3) Total inerts not to exceed 12%.
(4) To produce all steam requirements from waste heat.

These guarantees were being obtained to-day without difficulty under ordinary working conditions.

There was, added Mr. Scott, no reason for this type of plant losing its efficiency and reliability any more than any other type of gas production plant provided due regard was given to its operation, technical control, and supervision, and, not least, to its being looked after and kept clean.

The calorific value of gas supplied was 400 B.Th.U., obtained by a mixture of 28% coal gas and 72% Tully gas. The flexibility of the plant in gasifying either coal or coke extended to its ability to use varying qualities of either, and in these days of irregular qualities of both coal and coke, they find the plant a great asset.

* From a Paper to the Scottish Junior Gas Association (Eastern District).

Dividends

Gas Light & Coke.—On the 4% Consolidated Preference Stock at the rate of £4% per annum; on the 3¾% Redeemable Preference Stock, 1970, at the rate of £3 15s.%; on the 3½% Maximum Stock at the rate of £1 5s.%; on the Ordinary Stock at the rate of £1%; in each case subject to deduction of income tax. It is intended that, subject to unforeseen occurrences, the dividends shall be payable on March 25 next.

Commercial.—After considering the accounts of the Company for 1942, the Directors are unable to recommend dividends on the Ordinary or Preference Stocks of the Company for the year ended Dec. 31, 1942.

Watford and St. Albans.—A full dividend on all Preference Stocks of the Company, for the half-year ended Dec. 31, 1942, and a final dividend of 2½% on the Ordinary Stock, making £5% for the year (the same).

Cardiff.—On Feb. 18, dividends were declared as follows: On the 4½% Preference Stock at the rate of 2¼% for the half-year to Dec. 31, 1942, making 4½% for the year. On the Consolidated Ordinary Stock at 3½%, making 6% for the year. The Directors recorded with sorrow the death during the past year of Mr. William Ware, who had been a Director since 1927. The vacancy on the Board had been filled by the appointment of Mr. J. C. Clay, for the unexpired term of Mr. William Ware's appointment.

Yorktown (Camberley) and District.—Final dividends for the year (all less income tax at 10s. in the £) at the rate of £2 10s.% on the 5% Consolidated Preference Stock (making 5% for the year); £2% on the 4% Redeemable Preference Stock (making 4% for the year); £2 15s.% on the Consolidated Ordinary Stock (making £5 15s.% for the year).

Gas Products Prices

The London Market Feb. 15.

The chief item of interest in connexion with the Coal Tar Products market is the issue of a new Government Order, the Coal Tar Products Prices Order, 1942 (S. R. & O., 1942, No. 2509), which came into force on Jan. 1.

All Coal Tar Products are in good demand, and Pitch in the London area remains about 45s.

The Provinces Feb. 15.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Naphtha and Xylol controlled by the Coal Tar, Naphtha and Xylol Order, 1942, dated Dec. 7, 1942, and operative from Dec. 21. Carbolic acid, 60's, controlled by the Coal Tar Acids Prices (Inland) Order, 1942, operative from May 1. Naphthalene, controlled by the Naphthalene prices (Inland) Order, 1942, dated April 15, 1942, and operative from May 1, 1942, £19 to £19 10s.—bags free. Anthracene, controlled by the Anthracene Prices (Inland) Order, 1942, operative from May 1. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5½d.; timber preservation and other purposes 4¾d. to 6d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Feb. 13.

Prices are unchanged with deliveries proceeding rapidly. Refined tar controlled. Value is 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6½d. to 7d.; low gravity, 7¼d. to 7½d.; neutral oil, 6d. to 6½d.; hydrogenation oil, 5⅞d. per gallon; all *ex* Works in bulk. Refined cresylic acid is in good call in fair quantities at 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha: 6½d. to 7d. per gallon. Solvent naphtha: Basic prices delivered in bulk, 90/160 grade 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 3d. per gallon. Pyridine: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

Gas Stocks and Shares

Markets continued dull and uninteresting last week until late on Thursday, when sentiment received a fillip from Mr. Churchill's statement. This was continued on Friday, when home rails were a particularly strong feature after the L.M.S. dividend announcement. Gas stocks and shares were also brighter and attracted more attention. Prices were well maintained and, with the exception of the stocks of two companies operating outside this country, all movements were in an upward direction.

It is satisfactory to note that two of the three Metropolitan companies—*viz.*, the Gas Light & Coke Company and the South Metropolitan Gas Company—have resumed ordinary and preference dividend disbursements, particulars of which appear elsewhere in this issue. The Directors of the Commercial Gas Company, however, are again unable to recommend any dividend, and those with a knowledge of this Company's area of supply will fully appreciate the reason for the non-payment.

The following price changes occurred during the week:

PROVINCIAL EXCHANGES

Chester United Ord. (*x.d.*)	99¼—100½	Feb. 1	
Hartlepool Ord.	84—86	+9½	
Liverpool Ord.	105—106	+½	

OFFICIAL LIST

Alliance & Dublin	100—110	–7½
Cardiff (*x.d.*)	101—106	Feb. 8
Croydon max. Div.	90—95	+3
East Surrey "B" Ord....	83—88	+3
Gas Consolidation "B" Ord. ...	16/9—17/9	+–3d.
Gas Light & Coke 3½ p.c. max. ...	65—68	+1
Ditto 4 p.c. Pref.	85—90	+3
Ditto 3½ p.c. Red. Deb.	85—90	+5
Imperial Continental	76—81	–1
Portsmouth Ord. (*x.d.*)	103—108	Feb. 8
Primitiva Holdings Ord.	12/6—14/6	+1/–
South Metropolitan 6 p.c. Pref. ...	110—115	+10
Ditto 4 p.c. Pref.	83—88	+10
Ditto 3 p.c. Deb.	81—86	+1
South Suburban Ord. (*x.d.*)	88—93	Feb. 8
Ditto 5 p.c. Pref. (*x.d.*)	97—102	"
Ditto 4 p.c. Pref. (*x.d.*)	83—88	"
Ditto 3½ p.c. Red. Pref. (*x.d.*) ...	90—95	"
Southampton Ord. (*x.d.*)	73—78	"

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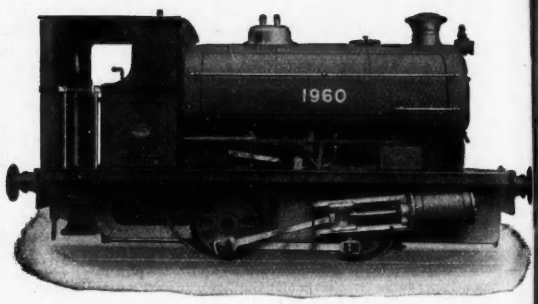
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